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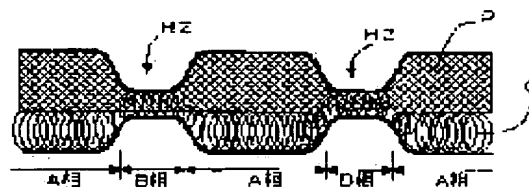
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(54) NONWOVEN FABRIC WITH DOUBLE PHASE STRUCTURE AND METHOD FOR PRODUCING THE SAME

(57)Abstract:

PROBLEM TO BE SOLVED: To provide a method for producing a nonwoven fabric with double phase structure having solved such a problem that a conventional technique for such nonwoven fabrics which requires respectively individually feeding a top sheet, an acquisition layer and another kind of material corresponding to an absorptive layer, each being a component of an absorptive form, has been highly complicate as a process.

SOLUTION: This nonwoven fabric with double phase structure has high air permeability and is composed of A-phase consisting of a bulky and sparingly water-permeable portion with low apparent density and B-phase consisting of an easily water-permeable portion adhered to the A-phase and having an apparent density higher than that of the A-phase. The A-phase has such a structure that hydrophobic fibrous layer(s) and hydrophilic fibrous layer(s) are superposed on each other in layers, while the B-phase has such a structure that hydrophobic fibers and hydrophilic fibers are compressed in an intermingled condition. The other objective method for producing such a nonwoven fabric is provided.



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CLAIMS

[Claim(s)]

[Claim 1] In a bulky and damage-at-sea [with small apparent density] penetrable part (A phase), and the nonwoven fabric which sticks with this A phase and consists of parts of **** permeability of larger apparent density than said A phase (B phase) and which was excellent in infiltration It is a nonwoven fabric with the diplophase structure characterized by for said A phase having the structure with which the hydrophobic fiber layer and the hydrophilic fiber layer lapped in the shape of a layer, and said B phase having the structure compressed where hydrophobic fiber and hydrophilic fiber are intermingled.

[Claim 2] The apparent density of said A phase is 0.10 g/cm³. It is the following and the apparent density of said B phase is 0.15 g/cm³. Nonwoven fabric with the diplophase structure according to claim 1 which it is above.

[Claim 3] The ratio of the area A which said A phase occupies, and the area B which said B phase occupies is $B/(A+B) \times 100 = 10-60$ (%).

The nonwoven fabric which came out and had a certain diplophase structure according to claim 1 or 2.

[Claim 4] The nonwoven fabric with which said B phase was distributed over band-like [two or more], and had diplophase structure given in any 1 term of claims 1-3 whose width of face of each band-like B phase is 2mm - 20mm in said A phase.

[Claim 5] The nonwoven fabric in which the each had the diplophase structure according to claim 4 currently formed by carrying out stream confounding processing according to two or more more high-pressure streams as said band-like B phase by which said nonwoven fabric sticks the card web which consists of hydrophobic combination *****, and the card web which consists of hydrophilic fiber to the A phase which carried out the reserve confounding with superposition and a low pressure stream.

[Claim 6] The nonwoven fabric in which spacing of the band-like B phase formed by [said] carrying out stream confounding processing had the diplophase structure according to claim 4 or 5 which is 10mm or more.

[Claim 7] The nonwoven fabric in which said nonwoven fabric had the diplophase structure according to claim 4 of having the A phase which was made combining the card web which uses hydrophobic heat welding nature fiber as a principal component, and the card web which uses hydrophilic fiber as a principal component superposition and by subsequently performing hot blast processing, and formed the whole, and the band-like B horizon which is made carrying out heating sticking by pressure of this A phase with a heat grid roll further, and is obtained.

[Claim 8] In a bulky and damage-at-sea [with small apparent density] penetrable part (A phase), and the manufacturing method of the nonwoven fabric which was excellent in infiltration which sticks with this A phase and consists of parts of **** permeability of larger apparent density than said A phase (B phase) The process which carries out the card web which consists of hydrophobic combination *****, and the card web which consists of hydrophilic fiber by superposition, is made to carry out the reserve confounding of both with a low pressure stream, and forms a web, The manufacturing method of the nonwoven fabric which had the diplophase structure characterized by having an A phase and stream confounding down stream processing

which forms two or more band-like B phases in this A phase by stream confounding processing in which a high-pressure stream is applied at intervals of predetermined in said web.

[Claim 9] The approach according to claim 8 to which said stream confounding down stream processing is carried out about each band-like B phase according to two or more approaching high-pressure streams.

[Claim 10] In a bulky and damage-at-sea [with small apparent density] penetrable part (A phase), and the manufacturing method of the nonwoven fabric which was excellent in infiltration which sticks with this A phase and consists of parts of **** permeability of larger apparent density than said A phase (B phase) The process which is made to carry out melting of a part of heat welding nature fiber for the card web which uses hydrophobic heat welding nature fiber as a principal component, and the card web which uses hydrophilic fiber as a principal component superposition and by subsequently performing hot blast processing, and forms a web, The manufacturing method of the nonwoven fabric which had the diplophase structure characterized by having an A phase and heating sticking-by-pressure down stream processing which forms two or more band-like B phases in this A phase by making the heat grid roll which prepared two or more annular heights at spacing of 2-20mm stick by pressure, and carrying out heating sticking by pressure in said web.

[Claim 11] The compound absorber which fixed the water-absorbing resin to the subject for said A phase part with a bulky nonwoven fabric with the diplophase structure indicated by any 1 term of claims 1-7.

[Claim 12] The absorber product constituted using as an absorber said compound absorber indicated by claim 11.

[Claim 13] The absorber product constituted using a nonwoven fabric with the diplophase structure indicated by any 1 term of claims 1-7 as a top sheet.

[Claim 14] The absorber product constituted using as a backseat a nonwoven fabric with the diplophase structure indicated by any 1 term of claims 1-7.

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DETAILED DESCRIPTION

[Detailed Description of the Invention]

[0001]

[Field of the Invention] One front face is related with the nonwoven fabric which whose front face of another side is hydrophobicity and moreover excelled [hydrophilic property] in infiltration, and the method of manufacturing this nonwoven fabric. Furthermore, this invention relates to absorber products, such as a diaper for – adults using such a nonwoven fabric for children, sanitary items for women, and a medical care supply.

[0002]

[Description of the Prior Art] if the fundamental view for discovering the function which sets this invention for an absorber product, and absorbs and fixes a liquid combines appropriately the top sheet excellent in liquid permeability, the acquisition layer which diffuses a liquid temporarily and stores it, and the absorption layer which absorbs a liquid and is fixed stably, it consists of the concept which acquires and says.

[0003] In the conventional technique, the nonwoven fabric with the high compression resistance with a hydrophilic property or the comparatively thin porous nonwoven fabric by which hydrophilization processing was carried out bulky as an acquisition layer is used as an absorption layer as a top sheet again, putting it together as an element with which the mixture of a water-absorbing resin (SAP)/pulp dissociated, respectively, and became independent.

[0004]

[Problem(s) to be Solved by the Invention] therefore, in order to manufacture an absorber product continuously on a scale of industrial It is required to supply separately the material of the other types corresponding to each element of the mixture of the top sheet which forms the subject of absorption, an acquisition layer, and SAP/pulp, respectively. and in order to unify the material of these other types, it is required in each of several steps of processes to use binding material, such as hot melt, so much -- etc. -- it becomes very complicated as a process.

[0005] Moreover, maintenance of the surface dry feeling required, for example of a top sheet and high water permeability are conditions which are mutually contradictory, and the problem that a Prior art is big also here exists. Conflict called the maintenance of a surface dry feeling and the high water permeability which the above Prior arts are holding is solved, and in order to attain the improvement in the function of demonstrating an acquisition function effectively further, it is necessary to arrange a hydrophobic fiber layer and a hydrophilic fiber layer effectively, and to maintain permeability and water permeability at stability more. Solution of such a technical problem is begun by compounding and composite-construction-izing the element which has each function, and becomes possible.

[0006] This invention offers a nonwoven fabric with the diplophase structure which has such various functions, and its manufacturing method.

[0007]

[Means for Solving the Problem] In the nonwoven fabric which sticks with a bulky and damage-at-sea [with small apparent density] penetrable part (A phase), and this A phase according to this invention, and consists of parts of **** permeability of larger apparent density than an A phase (B phase) and which was excellent in infiltration An A phase has the structure with which

the hydrophobic fiber layer and the hydrophilic fiber layer lapped in the shape of a layer, and a nonwoven fabric with the diplophase structure characterized by the B phase having the structure compressed where hydrophobic fiber and hydrophilic fiber are intermingled is offered. [0008] Preferably, the apparent density of an A phase is 0.10 g/cm³. It is the following and the apparent density of a B phase is 0.15 g/cm³. It is above. Although the ratio of the area A which an A phase occupies, and the area B which a B phase occupies is selectable in the large range, the desirable range is $B/(A+B) \times 100 = 10-60$ (%).

It comes out. The B phase is distributed in an A phase band-like [two or more], and the width of face of each band-like B phase is 2mm – 20mm preferably 1mm or more. Although it is desirable that it is one continuous band as for this band, it may consist of a discontinuous band. [0009] As a band-like B phase which sticks the card web which consists of hydrophobic desirable combination *****, and the card web which consists of hydrophilic fiber to the ** A phase which carried out the reserve confounding with superposition and a low pressure stream, the nonwoven fabric is formed, when the each carries out stream confounding processing according to two or more more high-pressure streams. Spacing of the formed band-like B phase is 10mm or more preferably by carrying out stream confounding processing.

[0010] Or a band-like B horizon can also be prepared by carrying out heating sticking by pressure of the card web which uses hydrophobic heat welding nature fiber as a principal component as a nonwoven fabric, and the card web which uses hydrophilic fiber as a principal component with a heat grid roll using superposition and the nonwoven fabric which was combined and formed the whole by subsequently performing hot blast processing.

[0011] In the manufacturing method of the nonwoven fabric which was excellent in infiltration which sticks this invention again with a bulky and damage-at-sea [with small apparent density] penetrable part (A phase), and this A phase, and consists of parts of **** permeability of larger apparent density than an A phase (B phase) By the process which carries out the card web which consists of hydrophobic combination *****, and the card web which consists of hydrophilic fiber by superposition, is made to carry out the reserve confounding of both with a low pressure stream, and forms a web, and stream confounding processing in which a high-pressure stream is applied to a web at intervals of predetermined The manufacturing method of a nonwoven fabric with the diplophase structure characterized by having an A phase and stream confounding down stream processing which forms two or more band-like B phases in this A phase is offered.

[0012] Stream confounding down stream processing can be performed about each band-like B phase according to two or more approaching high-pressure streams. In the manufacturing method of the nonwoven fabric which was excellent in infiltration which sticks this invention with a bulky and damage-at-sea [with small apparent density] penetrable part (A phase), and this A phase, and furthermore consists of parts of **** permeability of larger apparent density than an A phase (B phase) The process which is made to carry out melting of a part of heat welding nature fiber for the card web which uses hydrophobic heat welding nature fiber as a principal component, and the card web which uses hydrophilic fiber as a principal component superposition and by subsequently performing hot blast processing, and forms a web, By making the heat grid roll which prepared two or more annular heights at spacing of 2–20mm stick to a web by pressure, and carrying out heating sticking by pressure The manufacturing method of a nonwoven fabric with the diplophase structure characterized by having an A phase and heating sticking-by-pressure down stream processing which forms two or more band-like B phases in this A phase is offered.

[0013] The nonwoven fabric with the diplophase structure of this invention can be used as a compound absorber by fixing a water-absorbing resin for a bulky A phase part at a subject. Such a compound absorber is useful as an absorption element of an absorber product.

[0014] Moreover, the nonwoven fabric with the diplophase structure of this invention can be used as the top sheet of an absorber product, or a backseat.

[0015]

[Embodiment of the Invention] The fundamental configuration of a nonwoven fabric with the diplophase structure of this invention is explained with reference to a drawing. Drawing 1 shows

the web which consists of a hydrophobic fiber layer P which is applied to constituting a nonwoven fabric with the diplophase structure of this invention, and which consists of a card web, and a hydrophilic fiber layer Q which was put on this, and which similarly consists of a card web. This web is the part prolonged in seriate [two or more], and constitutes a nonwoven fabric with the diplophase structure of this invention as shown in drawing 2 by making the hydrophobic fiber layer P and the hydrophilic fiber layer Q compress mutually by the confounding or welding partially.

[0016] In drawing 2, the configuration fiber of the hydrophobic fiber layer P and the configuration fiber of the hydrophilic fiber layer Q are mixed with an A phase in the field which is maintaining the condition [that the hydrophobic fiber layer P and the hydrophilic fiber layers Q have only overlapped], and are partially mixed mutually a confounding or by carrying out welding in both layers, it is compressed and the field to which thickness was reduced is shown as a B phase. After it carries out the hydrophobic fiber layer P and the hydrophilic fiber layer Q by superposition and it carries out the reserve confounding of both with a low pressure stream, stream confounding processing in which a high-pressure stream is applied at intervals of predetermined can perform this compression by forming two or more band-like B phases in an A phase and this A phase.

[0017] The card web which uses hydrophobic heat welding nature fiber as a principal component, and the card web which uses hydrophilic fiber as a principal component Or superposition, Subsequently, after carrying out melting of a part of heat welding nature fiber by performing hot blast processing, when the heat grid roll which prepared two or more annular heights at spacing of 2-20mm is made to stick by pressure and carries out heating sticking by pressure, two or more band-like B phases can be formed in an A phase and this A phase. In the lamination, physical properties, and a function, the A phase differs from the B phase mutually, as shown in Table 1.

[0018]

[Table 1]

	層構成	物 性			機 能
		厚さ	強度	見掛け密度	
A相	疎水性層と親水性層が混在せずに重なり合っ て存在している	大	小	小	難水透過性
B相	疎水性層と親水性層が共存、混在している	小	大	大	吸水、透過による排出液の移送機能 強度の支持体

[0019] As shown in Table 1, when an A phase is contrasted with a B phase, thickness is large, and reinforcement is low although apparent density is low bulky. On the other hand, although a B phase is thin, reinforcement is high and it turns out that it is a strong base material so to speak.

[0020] The thickness of an A phase is 7 g/cm². It is the 0.5mm range of - 10mm in the measured value under a pressure. if it says with apparent density -- 0.10 g/cm³ the example of the following and many -- 0.08 g/cm³ - 0.02 g/cm³ it is . On the other hand, 0.1mm range of the thickness of a B phase is - 1mm in the measured value in the same conditions. if it says with apparent density -- 0.15 g/cm³ the above -- many examples -- 0.17 g/cm³ -0.5g/cm³ it is . Although the comparison of the reinforcement of an A phase and a B phase is not easy, a B phase is 4kg/50mm-20kg/50mm to an A phase being 1.0 -5kg/50mm. When a scale factor shows the difference between the A phase in lamination, above-mentioned reinforcement, and above-mentioned apparent density, and a B phase, between an A phase and a B phase, it turns out that there is a difference as shown in the following range.

Thickness: A/B=1.5 Twice -30 time (usually three to 10 times)

Reinforcement: B/A=2.0 Twice -20 time (usually 2.5 to 10 times)

Apparent density: B/A=1.5 Twice -10 time (it is usually 2.0-5.0 twice)

[0021] As configuration fiber of the hydrophobic fiber layer P, although synthetic fibers, such as PP fiber, PET fiber, and PE fiber, these bicomponent fibers, or the mixture of those is mentioned,

when applying welding to formation of a B phase, the thing containing a **** welding component is good as a welding component. As an example of **** welding nature fiber, an easily dissolvable **** PET copolymer, a PE/PET bicomponent fiber, a PE/PP bicomponent fiber, an easily dissolvable **** PP copolymer / PP bicomponent fiber, etc. are mentioned. if the hydrophilic processing fiber of cellulosic fibers, such as rayon, a cotton, and acetate, or the above-mentioned synthetic fiber is used and the rate of P:Q is expressed with the content of Q as configuration fiber of the hydrophilic fiber layer Q -- the whole -- it is preferably [20 - 60% of] desirable 10 to 90% or more.

[0022] A material-difference point is water permeability most between an A phase and a B phase. That is, since it is in the condition which a hydrophobic fiber layer and hydrophilic fiber were hardly mixed mutually, and lapped, even if an aqueous liquid contacts an A phase to a hydrophobic front-face side, it is difficult for making it penetrate, unless a pressure is put. On the other hand, if a B phase is seen from a hydrophobic fiber side, hydrophilic fiber is mixed in hydrophobic fiber and much hydrophilic fiber has the structure where the tip is exposed to a front face. And by the usual B horizon creation approach, since the abundance of hydrophilic fiber has many lower layers (hydrophilic layer side) clearly, it will have the inclination of a hydrophilic property about the thickness direction.

[0023] When an aqueous liquid contacts a B phase for such structure, through this B phase, a liquid will permeate quickly and will penetrate a B phase. If a nonwoven fabric with the diplophase structure of this invention of having such a property is used as a top sheet (skin contact sheet) for example, in an absorber product by arrangement which is located in a wearer's skin side in a hydrophobic front face, the liquid discharged by the wearer will be quickly absorbed through a B phase, but since the front face of an A phase does not get wet and moisture moreover does not remain, the dryness of the skin is maintained. Furthermore, it uses, for example as a base fabric of a sheet-like absorber, and a part is coated with the slurry of a water-absorbing resin (SAP) at the A phase of a bulky hydrophobic side, and when it considers as the structure where the SAP particle was made to involve between fiber, a B phase works as a channel for distributing and diffusing a liquid, and contributes to improvement in the area use effectiveness of an absorber.

[0024] In order to demonstrate effectively and efficiently a mutually different function of such an A phase and a B phase, a B phase's existence condition is important. The 1st is the width of face of a B phase, and the 2nd is B phase's existence area.

[0025] With one gestalt of this invention, the B phase is distributed in an A phase band-like [two or more]. Although the band of this B phase may be one continuous band or may be two or more discontinuous bands, it is important for it that it is a band with a certain amount of width of face. Although it is based also on extent of the surface tension of the liquid discharged in being a line with very narrow width of face, a liquid forms the shape of a grain over a line, and smooth osmosis is not performed.

[0026] Although the width of face of a band-like B phase changes also with conditions, such as description on the front face of hydrophobic, it is usually desirable for 1mm or more than it to be 2mm - 20mm desirable still more preferably.

[0027] What is necessary is just to specify the grid width of face of the grid roll to be used, when being stuck by pressure where melting is carried out with heat using a grid roll in order to form a B phase with such width of face. Moreover, since it is difficult to form band-like [of the width of face of the above-mentioned desirable range] in having used one nozzle beam with the nozzle arranged at continuation when applying the stream confounding by the high-pressure stream, it is desirable to use the nozzle beam which has arranged 2-5 nozzle groups at fixed spacing. In this case, although the band of the B phase formed is the set of the confounding line of two or more trains microscopically, it functions as a band of desired width of face as the whole. In addition, if there are too many discharge openings when using a nozzle beam, since a high-pressure stream may not be acquired for a lifting and a desirable confounding pattern in flooding, cautions are required. Using the nozzle of a pitch with this fine reserve stream confounding, when using the web to which the reserve confounding of a hydrophobic fiber layer and the hydrophilic fiber layer was carried out with the stream of the low voltage force, perform a stream confounding by the low pressure of about 20kg/cm², and the stream confounding for B phase

formation is more remarkably [than it] high, for example, they are 50 kg/cm². Or it is desirable to carry out with the high pressure beyond it.

[0028]

[Example] (Example 1)

The two-layer card web which consists of the hydrophobic fiber layer P and the hydrophilic fiber layer Q of a presentation of the <manufacture of nonwoven fabric with diplophase structure> following was prepared.

Hydrophobic fiber layer P PE/PET (3dx51mm) 40% 8 g/m² PET (7dx61mm) 60% 12 g/m²
 Hydrophilic fiber layer Q Viscose rayon (1.5 dx51mm) 100% 20 g/m² 40 g/m² This two-layer card web is piled up mutually, it leads to a stream processor, and they are diameter of nozzle 0.1mm phi, and nozzle spacing of 0.5mm as first stage processing. A nozzle beam is used and it is 20 kg/cm². Overall treatment was performed by water fluid pressure, and the web was prepared. Subsequently, the nozzle beam which prepared mutually the nozzle group which consists of diameter of nozzle 0.15mmphi and three nozzles arranged at intervals of [of 1mm] a nozzle as second stage processing at intervals of 15mm is used, and it is 80 kg/cm². After performing confounding processing of partial reinforcement by water fluid pressure, it was made to dry and the stream confounding nonwoven fabric with the diplophase structure where a B phase is distributed in an A phase band-like [two or more] was obtained.

[0029] the obtained nonwoven fabric is shown in drawing 3 -- as -- a bulky A phase and the B phase of a low consistency -- having -- a B phase -- comparatively (B/(A+B) x100) -- the apparent density of about 15% and an A phase -- the apparent density of 0.07 g/cm³ and a B phase -- 0.2 g/cm³ it was .

[0030] EtOH is set to EtOH/water =60/40 in 0.5 % water solution of <use as coating base material of water-absorbing resin (SAP)> PEO (** material for paper manufacture, Sumitomo Seika Chemicals make) -- as -- adding -- a part -- to the viscous liquid which became gel, SAP (the Sumitomo Seika Chemicals make, trade name "SA-60S") was added so that it might become about 20%, and the slurry of SAP was prepared to it. An applicator is used for the hydrophobic fiber layer P front face of the above-mentioned nonwoven fabric for this viscous slurry, and they are 200 g/m² at SAP eyes. It was made to apply and deliquor and dry so that it may become, and the sheet-like absorber was obtained. When the obtained absorber was observed, most SAP existed in the part of an A phase, and it hardly existed in the part of a B phase. Even if SAP of an A phase was caught by the web at stability and carried out oscillating processing after desiccation, omission of SAP were hardly produced.

[0031] (Example 2) The two-layer card web which consists of the hydrophobic fiber layer P and the hydrophilic fiber layer Q of the following presentation was prepared.

Hydrophobic fiber layer P PE/PET (3dx51mm) 100% 20 g/m² Hydrophilic fiber layer Q PE/PET (3dx45mm) 40% 8 g/m² Viscose rayon (1.5 dx35mm) 60% 12 g/m² 40 g/m² This two-layer card web is put on a network conveyor in the condition of having piled up mutually. Passed the hot blast zone heated by about 135 **, and carried out melting of a part of PE/PET component, it was made to join to other fiber, and the bulky web by the so-called through air bond method was manufactured. It was made to move at the rate of 20 m/min, an annular projection with a width of face of 3mm being formed in a peripheral surface at intervals of 10mm, heating the iron grid roll with which Teflon (trademark) processing of the front face was carried out in skin temperature of 180 degrees C, and making it stuck to the front face of the obtained web by pressure by the pressure of 40 kg/cm.

[0032] that in which the nonwoven fabric obtained by this has a bulky A phase, and compression and the B phase by which welding was carried out as shown in drawing 4 -- it is -- a B phase -- comparatively (B/A+Bx100) -- the apparent density of about 30% and an A phase -- the apparent density of 0.06 g/cm³ and a B phase -- 0.3 g/cm³ it was .

[0033] When removed the facing of a <use as facing of absorber> marketing diaper (the Uni Charm Corp. make, a trade name "mummy poco power slim"), it substituted for the above-mentioned nonwoven fabric, the physiological saline was poured in and the absorption test was performed, liquid was quickly absorbed only from the B phase, the reversion or absorption remainder was not accepted, either but an absorbed part was maintaining the very dry condition.

[0034]

[Effect of the Invention] The nonwoven fabric which had the diplophase structure of this invention as explained above In a bulky and damage-at-sea [with small apparent density] penetrable part (A phase), and the nonwoven fabric which sticks with this A phase and consists of parts of **** permeability of larger apparent density than an A phase (B phase) and which was excellent in infiltration An A phase has the structure with which the hydrophobic fiber layer and the hydrophilic fiber layer lapped in the shape of a layer, and the B phase has the structure compressed where hydrophobic fiber and hydrophilic fiber are intermingled. Conflict called maintenance of a surface dry feeling and high water permeability can be solved by this, and the improvement in the function of demonstrating an acquisition function effectively further can be attained. Therefore, when a nonwoven fabric with this diplophase structure is used for a top sheet by arrangement which is located in a wearer's skin side in a hydrophobic front face at an absorber product, the liquid discharged by the wearer is quickly absorbed through a B phase, but since the front face of an A phase does not get wet and moisture moreover does not remain, the remarkable effectiveness that the dryness of the skin is maintained is acquired.

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DESCRIPTION OF DRAWINGS

[Brief Description of the Drawings]

[Drawing 1] The sectional view showing typically the web which consists of a hydrophobic fiber layer applied to constituting a nonwoven fabric with the diplophase structure of this invention, and a hydrophilic fiber layer.

[Drawing 2] The sectional view showing typically a nonwoven fabric with the diplophase structure of this invention.

[Drawing 3] The sectional view showing typically a nonwoven fabric with the diplophase structure acquired in the example 1 of this invention.

[Drawing 4] The sectional view showing typically a nonwoven fabric with the diplophase structure acquired in the example 2 of this invention.

[Description of Notations]

P Hydrophobic fiber layer

Q Hydrophilic fiber layer

WJ Water jet seal line

HZ Heat-sealing zone

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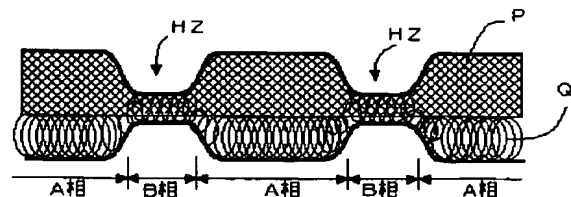
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(54) 【発明の名称】 複相構造を持った不織布およびその製造法

(57) 【要約】

【課題】 吸収体を構成するトップシート、アクイジション層、および吸収層に対応する他種類の素材をそれぞれ別個に供給することが必要な従来技術は、プロセスとしてきわめて複雑となる。

【解決手段】 高高度で見掛け密度の小さい水難透過性の部分 (A相) と、このA相と密着し、A相よりも大きい見掛け密度の水易透過性の部分 (B相) とから構成されている、透気性の優れた不織布において、A相は疎水性繊維層と親水性繊維層とが層状に重なった構造を有し、B相は疎水性繊維と親水性繊維とが混在した状態で圧縮された構造を有している、複相構造を持った不織布、ならびにその製造法。



【特許請求の範囲】

【請求項1】 嵩高で見掛け密度の小さい水難透過性の部分（A相）と、このA相と密着し、前記A相よりも大きい見掛け密度の水易透過性の部分（B相）とから構成されている、透気性の優れた不織布において、前記A相は疎水性繊維層と親水性繊維層とが層状に重なった構造を有し、前記B相は疎水性繊維と親水性繊維とが混在した状態で圧縮された構造を有していることを特徴とする複相構造を持った不織布。

【請求項2】 前記A相の見掛け密度が $0.10\text{g}/\text{cm}^2$ 以下であり、前記B相の見掛け密度が $0.15\text{g}/\text{cm}^2$ 以上である請求項1に記載の複相構造を持った不織布。

【請求項3】 前記A相の占める面積Aと、前記B相の占める面積Bとの比が、 $B/(A+B) \times 100 = 10 \sim 60 (\%)$ である請求項1または2に記載の複相構造を持った不織布。

【請求項4】 前記B相が前記A相内に複数の帯状に分布しており、各帯状B相の幅が $2\text{mm} \sim 20\text{mm}$ である請求項1～3のいずれか1項に記載の複相構造を持った不織布。

【請求項5】 前記不織布が、疎水性の化合繊維からなるカードウェブと、親水性繊維からなるカードウェブとを重ね合わせ、低圧力水流で予備交絡させたA相に密着する前記帯状B相として、その各々が、さらに複数本の高圧水流によって水流交絡処理することにより形成されている請求項4に記載の複相構造を持った不織布。

【請求項6】 前記水流交絡処理することにより形成された帯状B相の間隔が 10mm 以上である請求項4または5に記載の複相構造を持った不織布。

【請求項7】 前記不織布が、疎水性の熱融着性繊維を主成分とするカードウェブと、親水性繊維を主成分とするカードウェブとを重ね合わせ、ついで熱風処理を施すことにより全体を結合させて形成したA相と、さらにこのA相を熱グリッドロールにより加熱圧着させて得られる帯状のB層とを有している請求項4に記載の複相構造を持った不織布。

【請求項8】 嵩高で見掛け密度の小さい水難透過性の部分（A相）と、このA相と密着し、前記A相よりも大きい見掛け密度の水易透過性の部分（B相）とから構成されている、透気性の優れた不織布の製造法において、疎水性の化合繊維からなるカードウェブと、親水性繊維からなるカードウェブとを重ね合わせ、両者を低圧力水流で予備交絡させてウェブを形成する工程と、前記ウェブに、所定間隔で高圧水流を当てる水流交絡処理により、A相と、このA相内に帯状の複数のB相を形成する水流交絡処理工程と、を備えていることを特徴とする複相構造を持った不織布の製造法。

【請求項9】 前記水流交絡処理工程が、各帯状B相について複数本の近接する高圧水流により行われる請求項

8に記載の方法。

【請求項10】 嵩高で見掛け密度の小さい水難透過性の部分（A相）と、このA相と密着し、前記A相よりも大きい見掛け密度の水易透過性の部分（B相）とから構成されている、透気性の優れた不織布の製造法において、

疎水性の熱融着性繊維を主成分とするカードウェブと、親水性繊維を主成分とするカードウェブとを重ね合わせ、ついで熱風処理を施すことにより熱融着性繊維の一部を熔融させてウェブを形成する工程と、前記ウェブに、 $2 \sim 20\text{mm}$ の間隔で複数の環状突起部を設けた熱グリッドロールを圧着させて加熱圧着させることにより、A相と、このA相内に帯状の複数のB相を形成する加熱圧着処理工程と、を備えていることを特徴とする複相構造を持った不織布の製造法。

【請求項11】 請求項1～7のいずれか1項に記載された複相構造を持った不織布の嵩高な前記A相部分を主体に、高吸水性樹脂を固定した複合吸収体。

【請求項12】 請求項11に記載された前記複合吸収体を吸収体として用いて構成された吸収体製品。

【請求項13】 請求項1～7のいずれか1項に記載された複相構造を持った不織布をトップシートとして用いて構成された吸収体製品。

【請求項14】 請求項1～7のいずれか1項に記載された複相構造を持った不織布をバックシートとして用いて構成された吸収体製品。

【発明の詳細な説明】

【0001】

【発明の属する技術分野】一方の表面が親水性で、他方の表面が疎水性であり、しかも透気性の優れた不織布、およびこの不織布を製造する方法に関する。さらに本発明は、このような不織布を利用した子供用・大人用オムツ、女性用生理用品、メディカルケア用品等の吸収体製品に関する。

【0002】

【従来の技術】本発明は、吸収体製品において、液体を吸収および固定する機能を発現するための基本的な考え方は、液体透過性に優れたトップシートと、液体を一時的に拡散、貯留するアクイジション層と、液体を吸収して安定的に固定する吸収層とを適切に組み合わせるという概念から成り立っている。

【0003】従来技術においては、トップシートとして親水性もしくは親水化処理された比較的薄い多孔性の不織布が、アクイジション層としては嵩高な圧縮抵抗の高い不織布が、また吸収層としては高吸水性樹脂（SAP）／バルブの混合体が、それぞれ分離、独立した要素として組み合わされて使用されている。

【0004】

【発明が解決しようとする課題】したがって、吸収体製品を工業的規模で連続的に製造するためには、吸収の主

体をなすトップシート、アクイジション層、およびSAP/バルブの混合体の各要素に対応する他種類の素材をそれぞれ別個に供給することが必要であり、しかもこれら他種類の素材を一体化するためには、数段階の工程の各々でホットメルト等の結合材を多量に使用することが必要である等、プロセスとしてきわめて複雑となる。

【0005】また、例えばトップシートに要求される表面ドライ感の維持と高い水透過性とは互いに矛盾する条件であり、従来の技術はここにも大きな問題が存在する。上述のような従来の技術が抱えている、表面ドライ感の維持と高い水透過性という矛盾を解決し、さらにアクイジション機能を効果的に発揮させるなどの機能面での改善を達成するためには、疎水性繊維層と親水性繊維層とを効果的に配置し、通気性と水透過性とをより安定に保つ必要がある。このような課題の解決は、個々の機能を兼ね備えた要素を複合して複合構造化することによりはじめて可能になる。

【0006】本発明は、このような多機能を兼ね備えた、複相構造を持った不織布とその製造法を提供する。

【0007】

【課題を解決するための手段】本発明によれば、高高度で見掛け密度の小さい水難透過性の部分（A相）と、このA相と密着し、A相よりも大きい見掛け密度の水易透過性の部分（B相）とから構成されている、透気性の優れた不織布において、A相は疎水性繊維層と親水性繊維層とが層状に重なった構造を有し、B相は疎水性繊維と親水性繊維とが混在した状態で圧縮された構造を有していることを特徴とする複相構造を持った不織布が提供される。

【0008】好ましくは、A相の見掛け密度は、 $0.10\text{g}/\text{cm}^2$ 以下であり、B相の見掛け密度は $0.15\text{g}/\text{cm}^2$ 以上である。A相の占める面積Aと、B相の占める面積Bとの比は、広い範囲で選択可能であるが、好ましい範囲は、 $B/(A+B) \times 100 = 10 \sim 60 (\%)$ である。B相は、A相内に複数の帯状に分布しており、各帯状B相の幅は、1mm以上、好ましくは2mm～20mmである。この帯は、連続する1本の帯であることが望ましいが、不連続な帯からなってもよい。

【0009】不織布は、好ましくは疎水性の化合繊維からなるカードウェブと、親水性繊維からなるカードウェブとを重ね合わせ、低圧力水流で予備交絡させたA相に密着する帯状B相として、その各々が、さらに複数本の高圧水流によって水流交絡処理することにより形成されているものである。水流交絡処理することにより形成された帯状B相の間隔は、好ましくは10mm以上である。

【0010】あるいは、不織布として、疎水性の熱融着性繊維を主成分とするカードウェブと、親水性繊維を主成分とするカードウェブとを重ね合わせ、ついで熱風処理を施すことにより全体を結合させて形成した不織布を

用い、熱グリッドロールにより加熱圧着させることにより帯状のB相を設けることもできる。

【0011】本発明はまた、高高度で見掛け密度の小さい水難透過性の部分（A相）と、このA相と密着し、A相よりも大きい見掛け密度の水易透過性の部分（B相）とから構成されている、透気性の優れた不織布の製造法において、疎水性の化合繊維からなるカードウェブと、親水性繊維からなるカードウェブとを重ね合わせ、両者を低圧力水流で予備交絡させてウェブを形成する工程と、ウェブに、所定間隔で高圧水流を当てる水流交絡処理により、A相と、このA相内に帯状の複数のB相を形成する水流交絡処理工程と、を備えていることを特徴とする複相構造を持った不織布の製造法を提供する。

【0012】水流交絡処理工程は、各帯状B相について複数本の近接する高圧水流により行うことができる。さらに本発明は、高高度で見掛け密度の小さい水難透過性の部分（A相）と、このA相と密着し、A相よりも大きい見掛け密度の水易透過性の部分（B相）とから構成されている、透気性の優れた不織布の製造法において、疎水性の熱融着性繊維を主成分とするカードウェブと、親水性繊維を主成分とするカードウェブとを重ね合わせ、ついで熱風処理を施すことにより熱融着性繊維の一部を溶融させてウェブを形成する工程と、ウェブに、2～20mmの間隔で複数の環状突起部を設けた熱グリッドロールを圧着させて加熱圧着させることにより、A相と、このA相内に帯状の複数のB相を形成する加熱圧着処理工程と、を備えていることを特徴とする複相構造を持った不織布の製造法を提供する。

【0013】本発明の複相構造を持った不織布は、高高度なA相部分を主体に、高吸水性樹脂を固定することにより、複合吸収体として利用することが可能である。このような複合吸収体は、吸収体製品の吸収要素として有用である。

【0014】また本発明の複相構造を持った不織布は、吸収体製品のトップシート、またはバックシートとして利用することが可能である。

【0015】

【発明の実施の形態】本発明の複相構造を持った不織布の基本的な構成について図面を参照して説明する。図1は、本発明の複相構造を持った不織布を構成するのに適用される、カードウェブからなる疎水性繊維層Pと、これに重ね合わされた、同じくカードウェブからなる親水性繊維層Qとからなるウェブを示している。このウェブは、複数の列状に延びる部分で、疎水性繊維層Pと親水性繊維層Qとを相互に部分的に交絡もしくは融着により圧縮させることにより、図2に示すような、本発明の複相構造を持った不織布を構成する。

【0016】図2において、疎水性繊維層Pと親水性繊維層Qとが単に重なり合ったままの状態を保っている領域をA相、両層を部分的に交絡もしくは融着させること

により、疎水性繊維層Pの構成繊維と、親水性繊維層Qの構成繊維とが相互に混ざり合って圧縮され、厚みを低下させた領域をB相として示している。この圧縮は、疎水性繊維層Pと親水性繊維層Qとを重ね合わせ、両者を低圧力水流で予備交絡させたのち、所定間隔で高圧水流を当てる水流交絡処理により、A相と、このA相内に帯状の複数のB相を形成することにより行うことができる。

【0017】あるいは、疎水性の熱融着性繊維を主成分とするカードウェブと、親水性繊維を主成分とするカー*10

*ドウェブとを重ね合わせ、ついで熱風処理を施すことにより熱融着性繊維の一部を溶解させたのち、2~20mmの間隔で複数の環状突起部を設けた熱グリッドロールを圧着させて加熱圧着させることにより、A相と、このA相内に帯状の複数のB相を形成することができる。A相とB相は、その層構成、物性および機能において、表1に示すように相互に異なっている。

【0018】

【表1】

	層構成	物 性			機 能
		厚さ	強度	見掛け密度	
A相	疎水性層と親水性層が混在せずに重なり合って存在している	大	小	小	疎水透過性
B相	疎水性層と親水性層が共存、混在している	小	大	大	吸水、透過による排出液の移送機能 強度の支持体

【0019】表1に示すように、A相は、B相に対比すると厚さが大きく、見掛け密度が低くバルキーであるが、強度は低い。一方、B相は薄い強度が高く、いわば強度の支持体となっていることが分かる。

【0020】A相の厚さは、7g/cm²の圧力下での測定値で0.5mm~1.0mmの範囲である。見掛け密度でいえば、0.10g/cm³以下、多くの例では0.08g/cm³~0.02g/cm³である。一方、B相の厚さは、同一条件での測定値※

厚さ： A/B=1.5倍~30倍

強度： B/A=2.0倍~20倍

見掛け密度： B/A=1.5倍~10倍

※で0.1mm~1mmの範囲である。見掛け密度でいえば、0.15g/cm³以上、多くの例では0.17g/cm³~0.5g/cm³である。A相とB相との強度の比較は容易ではないが、A相が1.0~5kg/50mmであるのに対して、B相は4kg/50mm~20kg/50mmである。上記の層構成、強度および見掛け密度におけるA相およびB相間の相違を倍率で示すと、A相とB相の間には下記の範囲で示すような差があることが分かる。

(通常は3~10倍)

(通常は2.5~10倍)

(通常は2.0~5.0倍)

【0021】疎水性繊維層Pの構成繊維としては、PP繊維、PET繊維、PE繊維等の合成繊維類、またはこれらの複合繊維、あるいはその混合体が挙げられるが、B相の形成に融着を適用する場合には、融着成分として、易熱融着成分を含むものがよい。易熱融着性繊維の例としては、易熔融性PETコポリマー、PE/PET複合繊維、PE/PP複合繊維、易熔融性PPコポリマー/PP複合繊維等が挙げられる。親水性繊維層Qの構成繊維としては、レーヨン、コットン、アセテート等のセルロース系繊維、あるいは上記合成繊維の親水性加工繊維が用いられ、P:Qの割合は、Qの含有量で表すと、全体の10~90%以上、好ましくは20~60%が好ましい。

【0022】A相とB相との間で最も重要な相違点は、水透過性である。すなわちA相は、疎水性繊維層と親水性繊維とが互いにほとんど混ざり合うことなく重なった状態であるため、疎水性の表面側に水性液体が接触させても、圧力を掛けない限り透過させることは難しい。一方、B相は、疎水性繊維面から見ると、疎水性繊維の中に親水性繊維が混ざり込み、多数の親水性繊維が先端を表面に露出している構造を持っている。しかも親水性

30 繊維の存在割合は、通常のB層作成方法では下層(親水性層側)が明らかに多いので、厚さ方向に関して親水性の勾配を持つことになる。

【0023】このような構造のため、B相に水性液体が接触すると、このB相を通じて液体は素早く浸透し、B相を透過することになる。このような特性を有する本発明の複相構造を持った不織布を、例えば吸収体製品において、疎水性表面を着用者の皮膚側に位置するような配置でトップシート(皮膚接触シート)として利用すると、着用者から排出された液体は、B相を通じて素早く吸収されるが、A相の表面は濡れず、しかも水分は残存しないので、皮膚の乾燥状態が保たれる。さらに、例えばシート状吸収体の基布として利用し、バルキーな疎水性面のA相に部分に高吸水性樹脂(SAP)のスラリーをコーティングして、SAP粒子を繊維間に包蔵させた構造とした場合には、B相は液体を分配、拡散させるためのチャンネルとして働き、吸収体の面積利用効率の向上に寄与する。

【0024】このようなA相およびB相の互いに異なる機能を有効に、かつ効率的に発揮させるためには、B相の存在状態が重要である。第1はB相の幅であり、第2

はB相の存在面積である。

【0025】本発明の一つの形態では、B相はA相の中に複数の帯状に分布している。このB相の帯は、連続する1本の帯であっても、不連続な複数の帯であってもよいが、ある程度の幅を持つ帯であることが重要である。きわめて幅の狭い線状である場合には、排出される液体の表面張力の程度にもよるが、液体が線をまたぐ粒状を形成し、スムーズな浸透が行われない。

【0026】帯状のB相の幅は、疎水性表面の性状等の条件によっても異なるが、通常は1mmもしくはそれ以上が好ましく、さらに好ましくは2mm～20mmであることが望ましい。

【0027】このような幅を持つB相を形成するためには、グリッドロールを用いて熱で溶融させた状態で圧着する場合には、使用するグリッドロールのグリッド幅を規定すればよい。また高圧水流による水流交絡を適用する場合には、連続に配置されたノズルを持つ1本のノズルビームを用いたのでは上記の好ましい範囲の幅の帯状を形成することが難しいので、2～5個のノズル群を一*

疎水性繊維層P

PE/PET	(3d×51mm)	40%	8q/m ²
PET	(7d×61mm)	60%	12q/m ²

親水性繊維層Q

ビスコースレーヨン (1.5 d×51mm)	100%	20q/m ²	40q/m ²
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この2層のカードウェブを相互に重ね合わせて水流処理装置に導き、第一段処理として、ノズル径0.1mmφ、ノズル間隔0.5mmのノズルビームを用い、20kq/cm²の水流圧で全面処理を行ってウェブを調製した。ついで第二段処理として、ノズル径0.15mmφ、ノズル間隔1mmで配置された3個のノズルからなるノズル群を、相互に15mmの間隔で設けたノズルビームを用いて、80kq/cm²の水流圧で部分的な強度の交絡処理を行った後、乾燥させて、A相内にB相が複数の帯状に分布する複相構造を持った水流交絡不織布を得た。

【0029】得られた不織布は、図3に示すように、嵩高なA相と、低密度のB相とを持ち、B相の割合(B/(A+B)×100)は約15%、A相の見掛け密度は0.07g/cm³、B相の見掛け密度は0.2g/cm³であった。

【0030】＜高吸水性樹脂(SAP)のコーティング基材としての利用＞PEO(製紙用粘材、住友精化製)※

疎水性繊維層P

PE/PET	(3d×51mm)	100%	20q/m ²
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親水性繊維層Q

PE/PET	(3d×45mm)	40%	8q/m ²
ビスコースレーヨン (1.5 d×35mm)	60%	12q/m ²	40q/m ²

この2層のカードウェブを相互に重ね合わせた状態でネットコンベアに載せ、約135℃に加熱された熱風ゾーンを通過させて、PE/PET成分を一部溶融させて他の

* 定間隔で配置したノズルビームを使用するのが望ましい。この場合に形成されるB相の帯は、微視的には複数列の交絡線の集合であるが、全体としては所望の幅の帯として機能する。なお、ノズルビームを使用する場合、吐出孔の数が多すぎると、高圧水流がフラッシングを起こし、好ましい交絡パターンが得られないことがあるので注意が必要である。疎水性繊維層と親水性繊維層とを低圧力的水流で予備交絡させたウェブを使用する場合、この予備水流交絡は細かいピッチのノズルを用い、例えば20kq/cm²程度の低い圧力で水流交絡を行い、B相形成のための水流交絡はそれよりも著しく高い、例えば50kq/cm²もしくはそれ以上の高圧で行うことが望ましい。

【0028】

【実施例】(実施例1)

＜複相構造を持った不織布の製造＞下記の組成の疎水性繊維層Pおよび親水性繊維層Qからなる2層のカードウェブを用意した。

※の0.5%水溶液に、EtOHをEtOH/水=60/40になるように添加して、一部ゲル状になった高粘度液に、SAP(住友精化製、商品名「SA-60S」)を約20%になるように添加してSAPのスラリーを調製した。この粘稠なスラリーを上記の不織布の疎水性繊維層P表面にアプリケータを用いて、SAP目付で200g/m²になるように塗布し、脱溶媒、乾燥させて、シート状の吸収体を得た。得られた吸収体を観察すると、SAPのほとんどはA相の部分に存在し、B相の部分にはほとんど存在しなかった。A相のSAPがウェブに安定に捕捉され、乾燥後に振動処理してもほとんどSAPの脱落は生じなかった。

【0031】(実施例2)下記の組成の疎水性繊維層Pおよび親水性繊維層Qからなる2層のカードウェブを用意した。

繊維と接合させ、いわゆるスルーエアーボンド法による高ウェブを製造した。得られたウェブの表面に、周面に幅3mmの環状突起が10mm間隔で形成され、表面がテ

フロン（登録商標）加工された鉄製のグリッドロールを表面温度180℃に加熱し、40 kg/cm²の圧力で圧着させながら、20 m/minの速度で移動させた。

【0032】これにより得られた不織布は、図4に示すように、高高度なA相と、圧縮および融着されたB相を有するもので、B相の割合（ $B/A+B \times 100$ ）は約30%、A相の見掛け密度は0.06g/cm²、B相の見掛け密度は0.3g/cm²であった。

【0033】＜吸収体の表面材としての利用＞市販オムツ（ユニチャーム社製、商品名「マミーポコパワースリム」）の表面材を取り除き、上記の不織布に差し替えて生理食塩水を注入して吸収テストを行ったところ、液はB相からのみ急速に吸収され、吸収分は逆戻りも吸収残りも認められず、きわめてドライな状態を保っていた。

【0034】

【発明の効果】以上に説明したように本発明の複相構造を持った不織布は、高高度で見掛け密度の小さい水難透過性の部分（A相）と、このA相と密着し、A相よりも大きい見掛け密度の水易透過性の部分（B相）とから構成されている、透気性の優れた不織布において、A相は疎水性繊維層と親水性繊維層とが層状に重なった構造を有し、B相は疎水性繊維と親水性繊維とが混在した状態で圧縮された構造を有している。これにより、表面ドライ

＊クイジション機能を効果的に発揮させるなどの機能面での改善を達成することができる。したがって、この複相構造を持った不織布を吸収体製品に、疎水性表面を着用者の皮膚側に位置するような配置でトップシートに利用した場合、着用者から排出された液体は、B相を通じて素早く吸収されるが、A相の表面は濡れず、しかも水分は残存しないので、皮膚の乾燥状態が保たれるという顕著な効果が得られる。

【図面の簡単な説明】

【図1】本発明の複相構造を持った不織布を構成するのに適用される疎水性繊維層と親水性繊維層からなるウェブを模式的に示す断面図。

【図2】本発明の複相構造を持った不織布を模式的に示す断面図。

【図3】本発明の実施例1で得られた複相構造を持った不織布を模式的に示す断面図。

【図4】本発明の実施例2で得られた複相構造を持った不織布を模式的に示す断面図。

【符号の説明】

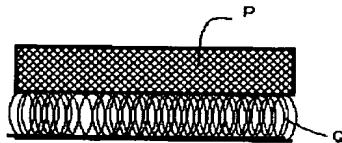
P 疎水性繊維層

Q 親水性繊維層

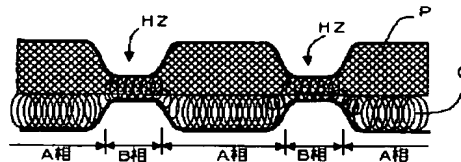
WJ ウォータージェットシールライン

HZ ヒートシールゾーン

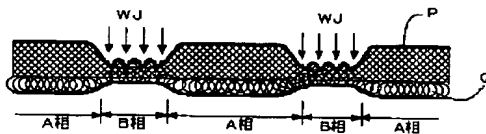
【図1】



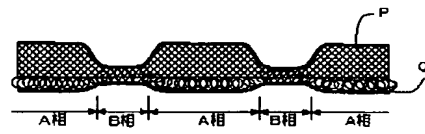
【図2】



【図3】



【図4】



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